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Addition to Second Note on the Lunar Theory.
By Prof. Cayley.

Writing as in my Second Note, *Monthly Notices,* Vol. xxv, pp. 203–207 (May 1865), for the Moon,

a, the mean distance,
e, the excentricity,
γ, the tangent of the inclination,
l, the mean longitude,
c, the mean anomaly,
g, the mean distance from node,

I obtained by the ordinary method of the variation of the elements, from the constant term of R and the term involving cos $(2c - 2g)$, the following expressions of the variations,

$$\delta a = 0$$

$$\delta e = -\frac{5}{8}\,\gamma^2 e \quad \cos 2c - 2g$$

$$\delta \gamma = +\frac{5}{8}\,\gamma e^2 \quad ,, \; 2c - 2g$$

$$\delta c = +\frac{5}{8}\,\gamma^2 \quad \sin 2c - 2g$$

$$\delta g = +\frac{5}{8}\,e^2 \quad ,, \; 2c - 2g$$

$$\delta l = +\frac{5}{16}\,\gamma^2 e^2 \quad ,, \; 2c - 2g$$

viz. if in the elliptic expressions of the radius vector, longitude, and latitude, we apply to a, e, γ, c, g, l, the foregoing increments, we obtain to the fourth order in (e, γ) the portions independent of m in the expressions of the radius vector, latitude, and longitude. I wish to notice that the results, to the very limited extent to which they go, agree with those obtained by M. Delaunay in his "Théorie du Mouvement de la Lune," from his 49th operation, the object of which is to take away the term (63) of R, that is the term involving cos $(2c - 2g)$. The formulæ (see vol. i. p. 788), taken only to the necessary degree of approximation are

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a	replaced by	a
e^2	,,	$e^2 - 5\ \gamma^2 e^2 \cos 2g$
γ^2	,,	$\gamma^2 + \frac{5}{4}\gamma^2 e^2$,, $2g$
l	,,	$l - \frac{5}{2}\gamma^2 \sin 2g$
$h+g+l$	,,	$h+g+l+\frac{5}{4}\gamma^2 e^2$,, $2g$
h	,,	$h+\frac{5}{8}e^2$,, $2g$

which, observing that

$$\begin{array}{ll} \gamma \ (\text{Del.}) & = \frac{1}{2}\gamma \ (\text{for present purpose}) \\ l & = c \\ g+l & = g \\ h+g+l & = l \\ \text{and } \therefore g & = -(c-g) \end{array}$$

become

a	replaced by	a
e^2	,,	$e^2 - \frac{5}{4}\gamma^2 e^2 \cos 2c - 2g$
γ^2	,,	$\gamma^2 + \frac{5}{4}\gamma^2 e^2$,, $2c-2g$
c	,,	$c + \frac{5}{8}\gamma^2 \sin 2c - 2g$
l	,,	$l - \frac{5}{16}\gamma^2 e^2$,, $2c-2g$
$l-g$	,,	$l-g-\frac{5}{8}e^2$,, $2c-2g$

the last of which may be changed into

g	,,	$g+\frac{5}{8}e^2$,, $2c-2g$

or if the new values of a, e, γ, c, g, l, are called $a+\delta a\ e+\delta e$, $\gamma+\delta\gamma$, $c+\delta c$, $g+\delta g$, $l+\delta l$, then the increments $\delta a, \delta e, \delta\gamma, \delta c, \delta g, \delta l$, have the values given above. The process of my Second Note, taken as a first transformation, has in fact the object of removing the term cos $(2c-2g)$, and to the degree of approxi-

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mation regarded, the result is not affected by the previous transformations, or by the substitution, t. ii. p. 800, introducing for a, e, γ, their standard elliptic values.

Notes on some Drawings of Mars, made during the recent Opposition. By John Browning, F.R.A.S.

The thirteen coloured drawings of *Mars* I have now the pleasure of exhibiting to the Society were made with Mr. Barnes' 8½-inch silvered-glass reflector. They represent the planet as it appeared on Dec. 29th, 1866, at 9^h 30^m G.M.T.; on Jan. 8th, 1867, at 9^h 1^m; Jan. 28th, at 9; on Jan. 28th, at 12.30; on Feb. 6th, at 8.15; on Feb. 6th, at 11.30; on Feb. 8th, at 8.30; on Feb. 8th, at 10.30; on Feb. 16th, at 6.45; on Feb. 23rd, at 8.45; on Feb. 23rd, at 10.30; and on Feb. 24th, at 1 A.M. Achromatic eye-pieces were used; generally the power was about 300, but occasionally I have used as high as 600.

I have shown these drawings to Mr. De La Rue, who had no trouble in matching two of them with his own two exquisite drawings of the planet. Mr. De La Rue's drawings which were taken by the aid of his 13-inch metal speculum of his own make, contain more detail than my own drawings, but Mr. De La Rue expressed his opinion that my drawings were valuable from the number I had succeeded in obtaining.

I have made nearly thirty sketches at the telescope, but I have copied only those that were made when the air was tolerably steady, and the definition so good that I could work well with high powers. When several sketches were made on the same evening, they were made at intervals of two hours, if the weather permitted. In only one instance have I failed to perceive that the form of the markings was permanent, due allowance being made for the effect of perspective in foreshortening them as they approached the edge of the disk.

It is highly probable that in the view of the planet taken on Feb. 16th, at 6.45, the two pointed markings on the extreme left, one above and the other below the equator, would have been seen united if they could have been observed when they were on the centre of the disk. This drawing would then have agreed pretty closely with one of Mr. Dawes' views engraved in the *Astronomical Register*, for Sept. 1865.

The colour of the body of *Mars* I have found vary from rose-madder to burnt-ochre, the colour appearing ruddiest when there was most mist in our atmosphere. The comparative absence of the ruddy colour towards the edges of the disk of the planet, Mr. Norman Lockyer has ascribed to the presence of clouds in the planet's own atmosphere.